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A long-term follow-up of 60 Lord total hip arthroplasties in rheumatic disease: a mean follow-up of 14 years

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Abstract The aim of the study was to analyse the survivorship of 60 total hip arthroplasties using the cementless Lord prosthesis in 51 patients with inflammatory joint disease. Patients were operated on between the years 1985 and 1988. The mean follow-up time was 13.8 (4.0–18.6) years. During the follow-up, one deep infection was encountered, and seven patients died of causes unrelated to the hip replacement. Revision surgery or death of the patient was used as an end point. The overall survival was 88.1% [95% confidence interval (CI) 76.6–94.1] for the stem, and 64.3% (95% CI 50.6–75.1) for the cup at 15 years. Causes for revision surgery were loosening of the cup in 17 hips, loosening of both components in five hips, and one deep infection.

Résumé Le but de cette étude est d'analyser la courbe de survie de 60 prothèses totales de hanche chez 51 patients présentant une pathologie inflammatoire, les malades ayant été prothésés avec une prothèse sans ciment de type Lord. Les patients ont été opérés entre 1985 et 1988. La moyenne de suivi a été de 13,8 ans (4 à 18,6 ans). Durant cette période une seule infection profonde a été rencontrée et 7 patients sont décédés sans relation avec leurs prothèses. La révision de la prothèse où la mort du patient a été utilisée comme terme pour l'utilisation de la courbe de survie, le

taux de survie a été de 88,1% (95% d'intervalle de confiance 76,6 à 94,1) pour la pièce fémorale et 64,3% (95% d'intervalle de confiance 50,6 à 75,1) pour la cupule à 15 ans. Les causes de révision ont été le descellement de la cupule dans 17 hanches et le descellement des deux composants dans 5 hanches avec une seule infection profonde.

Introduction

The hip joint is involved in 15–28% of patients with rheumatoid arthritis (RA) [10]. A total of 25–27% of patients will undergo total joint arthroplasty (TJA) during a 22–25-year course of their disease. Total hip arthroplasty (THA) accounts for 34–42% of the TJAs [19, 21].

The first cementless THA available in Finland was the Lord prosthesis in the 1980s. Our institution specialises in treating RA and related disorders, and for 3 years, all consecutive patients less than 53 years old with inflammatory joint disease and in need of THA were operated on using the Lord prosthesis [4, 8, 9]. Because of the young age of these patients and the need for longevity of the replacement, the cementless fixation was favoured in the hope of achieving better survival. Because the follow-up period is relatively long, we wanted to discover whether component survival was different from that in other Lord series and the causes for revision surgery.

Patients and methods

Between 1985 and 1988, 60 hips in 51 patients received a primary Lord THA at our institution. Preoperatively, 37 patients had the diagnosis of RA, 14 had juvenile rheumatoid arthritis (JRA), eight had spondyloarthropathy (SPA), and one had psoriatic arthropathy. There were 15 men (18 THAs) and 36 women (42 THAs). The mean follow-up period was 13.8 (4.0–18.6) years, and the patients' mean age at the time of THA was 37 (18–53) years. The patients' mean weight at the time of the

This study was conducted at the Rheumatism Foundation Hospital.

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procedure was 62.2 (37–94) kg. Thirty-two patients were taking glucocorticoids and seven were taking cytotoxic agents at the time of THA. The preoperative destruction of the hip joint was assessed by the Larsen method [12]. Patient characteristics are presented in Table 1.

All patients received a Lord cup and either a Mark I or Mark II Lord femoral stem. The Lord cup is threaded, smooth-surfaced, hemispherical, and made of a cobalt–chrome alloy. Both Mark I and II are madreporic porous-coated cementless stems, the only difference between the two types being that the Mark II stem has a smooth surface in the distal third. The Mark I type was used in 14 and the Mark II type in 46 THAs. THAs were performed using a direct lateral approach [5]. In 27 hips with acetabular dysplasia (mostly JRA patients with narrow pelvis) or insufficient bone stock, bone grafting was used to obtain sufficient coverage for the threaded cup.

The patients were advised to limit weight bearing for 6–8 weeks, and then full weight bearing was allowed. Antibiotic prophylaxis consisted of either methicillin or cephalosporin for 3 days. Aspirin was used for thrombosis prophylaxis. Radiographs were taken preoperatively and 2 or 3 days postoperatively. The patients visited the outpatient clinic at 3 months for clinical evaluation and then at 1, 4, 8, 12, and 16 years postoperatively for clinical and radiographic evaluation. The inclination of the socket and the thickness of the acetabular wall were measured, and signs of loosening and radiolucencies were recorded.

Table 1 Demographic, clinical, and radiographic characteristics of the 51 patients with inflammatory joint disease undergoing total hip arthroplasty

	Male (N=15)	Female (N=36)	All (N=51)
Number of hips	18	42	60
Mean age in years (SD)	36 (10)	37 (10)	37 (10)
Mean weight in kg (SD)	71.6 (11.4)	58.3 (9.4)	62.2 (11.7)
Diagnosis, N (%)			
Rheumatoid arthritis	7 (39)	30 (71)	1 (2)
Juvenile rheumatoid arthritis	3 (17)	11 (26)	8 (2)
Spondyloarthropathy	8 (44)	0 (0)	14 (23)
Psoriasis arthritis	0 (0)	1 (2)	37 (62)
Therapy			
Use of glucocorticoids, N (%)	4 (22)	28 (67)	32 (53)
Use of cytotoxic agents, N (%)	1 (6)	6 (14)	7 (12)
Preoperative Larsen grade of hip joint, N (%)			
2	5 (29)	6 (15)	11 (19)
3	6 (35)	21 (51)	27 (47)
4	2 (12)	7 (17)	9 (15)
5	4 (24)	7 (17)	11 (19)
Unknown	1	1	2

Forty-eight patients attended the 4-year follow-up examination, 48 patients (57 hips) the 8-year, 26 patients (29 hips) the 12-year, and 18 patients (20 hips) the 16-year.

The end points for survival analysis were revision surgery, the death of the patient, or the end of the year 2003. Seven patients died during the follow-up, but the causes of death were unrelated to THA. All data used in this investigation were collected from the patient records. Additionally, the National Arthroplasty Register was used to ascertain the longevity of the patients' prostheses [18] and to trace all the deaths and all revision operations possibly performed at other hospitals.

The survival analysis was based on the standard Kaplan–Meier method with confidence intervals (CIs). The Mantel–Cox test was used to determine whether the differences between the survival curves were significant, and the proportional hazards model was used to determine the effect of various variables on the risk of loosening of the THA prostheses.

The study is in accordance with the ethics standards of the responsible committee on human experimentation and with the Helsinki Declaration of 1975, as revised in 1983.

Results

The combined survival of acetabular and femoral components was 75.0% (95% CI 62.0–84.1) at 10 years and 64.3% (95% CI 50.6–75.1) at 15 years (Fig. 1). The survival of the Lord acetabular component was 75.0% (95% CI 62.0–84.1) at 10 years and 64.3% (95% CI 50.6–75.1) at 15 years. The femoral component achieved a survival of 91.7% (95% CI 81.1–96.4) at 10 years and 88.1% (95% CI 76.6–94.1) at 15 years. Seventeen percent of the patients used crutches at 1 year and 12% at 4 years postoperatively. None needed a wheelchair. Seventy-three percent of the patients were entirely pain free at 1 year and 65% at 4 years postoperatively. Radiographically, osteolysis was detected around the acetabular component in 7%,

Fig. 1 Combined survival of the Lord stem and acetabular components

Fig. 2 **a** Preoperative radiograph of a 17-year-old man with juvenile rheumatoid arthritis and Larsen grade 3 destruction of the hip joint. **b** Postoperative radiograph. **c** Radiograph 7 years postoperatively shows marked radiolucent lines and severe migration of the acetabular component. **d** Postoperative radiograph after rearthro-

plasty using allograft bone, a reinforcement ring, and a cemented acetabular component. **e** The most recent radiograph taken 15 years after the primary hip arthroplasty shows incorporation of the bone graft. However, there are marked radiolucent lines around the proximal part of the femoral component.

and moderate polyethylene wear was noted in 40% of the cups at 8 years postoperatively.

One deep infection was suspected 4 years postoperatively, but the bacterial culture taken around the prosthesis at the re-operation proved to be negative. Two hips dislocated postoperatively, but these THAs stabilised later without surgery.

Twenty-three hips needed further operation by the end of 2003. Six femoral components and 23 acetabular components were revised. In re-operations requiring the change of the femoral component, the acetabular component was also replaced simultaneously. Only a high preoperative Larsen grade proved to be a statistically significant risk factor for prosthesis loosening in this study [hazard ratio 1.55 (range 1.04–2.31), $p=0.032$; see Fig. 2]. Details of potential determinants of prosthesis loosening are presented in Table 2.

With the exception of the hip with suspected infection, all other re-operations were required for aseptic loosening of the femoral or acetabular component. No breakage of the femoral component was encountered, nor were any periprosthetic fractures.

Table 2 Proportional hazards model to determine the effect of various variables on the risk of loosening of total hip arthroplasty prostheses (CI confidence interval)

Variables	Hazard ratio (95% CI ^a)	<i>p</i> -value
Age (per 10 years)	1.14 (0.74–1.76)	0.54
Gender (male)	1.97 (0.73–5.29)	0.18
Weight (per 10 kg)	0.73 (0.39–1.37)	0.33
Preoperative Larsen grade of hip joint	1.55 (1.04–2.31)	0.032
Use of glucocorticoids	1.28 (0.35–4.72)	0.714
Use of cytotoxic agents	0.36 (0.09–1.34)	0.13
Socket inclination angle (<42° or >48°)	0.82 (0.34–1.97)	0.65
Thickness of acetabular wall (<6 mm)	1.70 (0.58 to 4.98)	0.64

^aRobust estimate of variance

Discussion

To our knowledge, no other articles have previously been published concerning the long-term results of the Lord prosthesis in patients with inflammatory joint disease. Grant and Nordsletten recently presented a series of 102 patients with different pathologies (116 THAs) who underwent THA with the Lord prosthesis [4]. The preoperative diagnoses for these patients were osteoarthritis (64%), developmental dysplasia (14%), fracture sequelae (12%), revision of a resurfacing arthroplasty (7%), Perthes disease (3%), and RA (1%). In their series, the stem had a cumulative survival of 98% (95% CI 95.3–100.7) and the acetabular component 65% (95% CI 53–72) at 17.5 years. In a mixed series of 88 patients (103 hips) reported by Kubo et al. in 2001, the survival of the femoral component was 96% and that of the acetabular component was 45% at 15 years [8]. Other studies confirm poor survival of the Lord cup [3, 6, 17].

Generally, threaded cups show acceptable results in short-term follow-ups [2, 20], whereas the survival rate is less favourable in midterm or long-term follow-ups [1, 16, 17]. Our results of the patients with inflammatory joint disease concur with those in the literature, indicating poor

Fig. 3 Survival curves for Lord femoral and acetabular components

survival of the threaded cup and reasonably good outcomes for the cementless stem.

High survival rates for the cementless femoral component have been reported in many studies [4, 6, 8, 9, 17]. The 88% survival at 15 years found in this study shows that the Lord femoral component has a rather favourable outcome in RA compared with other stem types [13, 16]. Jana et al. published a series of 82 THAs with a uncemented, porous-coated, anatomical medullary locking stem [7] with a 10-year survival of 98.1%. The Bi-Metric cementless stem had a survival of 97.4% at 10 years in patients with juvenile chronic arthritis [16].

A madreporic surface on the stem encourages good bone ingrowth and seems to work in all patient groups [14, 15]. A major flaw in implant design in the Lord prosthesis is the threaded acetabular component. The survival rate of the threaded cup drops radically after 7 years (Fig. 3). Cemented fixation has also yielded good results in series of patients with RA. In 1999 Lehtimäki et al. published a series of 553 THAs using the cemented Charnley prosthesis in RA. The 15-year survival rate was 87.1% for the Charnley cup and 89.9% for the Charnley cemented stem [13].

The Lord femoral component causes excessive bone resorption as a result of stress shielding [1, 17]. Grant and Nordsletten reported a fractured stem in their long-term follow-up series [4]. Malchau et al. reported thinning of cortical bone surrounding the distal parts of the stem after 10 years, although some thickening was present after shorter follow-up [17]. Laine et al. measured the postoperative radiographic “fit and fill” of two different femoral stem designs including the second-generation (Bi-Metric, straight proximally porous-coated) and third-generation [Anatomic Benoux Girard (ABG), proximally anatomical, hydroxyapatite-coated and distally overreamed] cementless stems [11]. The straight stem had substantially more cortical contact in the diaphyseal bone. Subsidence (>2 mm) was more frequent with the anatomical ABG stems, although the ABG stems had better bone ingrowth in the lower metaphyseal area. First-generation cementless fixation of Lord-type THA is part of the history of endoprothetic surgery at the time of writing of this report. We found the threaded cup to yield poor results, in parallel with previous reports, whereas the Lord stem proved to be a relatively good choice in inflammatory joint disease.

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